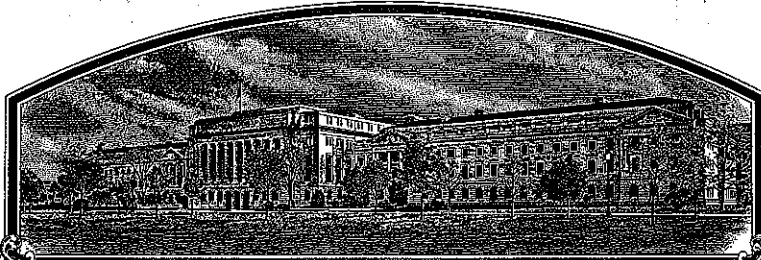


No.

200800300



# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

The United States Government, as represented  
by the Secretary of Agriculture

Whereas, THERE HAS BEEN PRESENTED TO THE  
Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC FURNISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE APPLICANT(S) TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR PROPAGATING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSES, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED IN THE PLANT VARIETY PROTECTION ACT. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT, COMMON

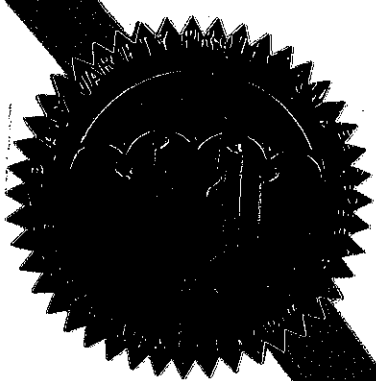
'Mace'

In Testimony Whereof, I have hereunto set my hand  
and caused the seal of the Plant Variety  
Protection Office to be affixed at the City of  
Washington, D.C. this ninth day of December, in  
the year two thousand and eight.

Attest:

Commissioner  
Plant Variety Protection Office  
Agricultural Marketing Service

Secretary of Agriculture

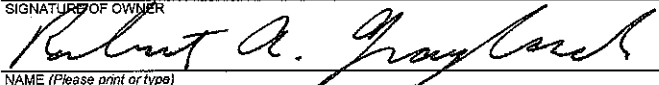


U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE  
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE  
(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER <i>MA# 8/20/08</i> The Government of the United States, Department of Agriculture, Agricultural Research Service, as represented by the Secretary of Agriculture		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME N02Y5117		3. VARIETY NAME Mace	
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country) 314 Biochemistry Hall, East Campus, University of Nebraska, Lincoln, NE 68583		5. TELEPHONE (include area code) 402-472-1490		FOR OFFICIAL USE ONLY PVPO NUMBER #200800300	
6. FAX (include area code) 402-472-4020		7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.) USDA agency		FILING DATE JUNE 3, 2008	
8. IF INCORPORATED, GIVE STATE OF INCORPORATION		9. DATE OF INCORPORATION		FILING AND EXAMINATION FEES: \$ 4,382.00 DATE 5/27/08 CERTIFICATION FEE: \$ 968.00 DATE 9/12/08	
10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. (First person listed will receive all papers) Robert A. Graybosch					
11. TELEPHONE (include area code) 402-472-1563		12. FAX (include area code) 402-472-4020		13. E-MAIL bob.graybosch@ars.usda.gov	
14. CROP KIND (Common Name) common wheat		16. FAMILY NAME (Botanical) Poaceae (Gramineae)		18. DOES THE VARIETY CONTAIN ANY TRANSGENES? (OPTIONAL) <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF SO, PLEASE GIVE THE ASSIGNED USDA-APHIS REFERENCE NUMBER FOR THE APPROVED PETITION TO DEREGULATE THE GENETICALLY MODIFIED PLANT FOR COMMERCIALIZATION.	
15. GENUS AND SPECIES NAME OF CROP Triticum aestivum		17. IS THE VARIETY A FIRST GENERATION HYBRID? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD ONLY AS A CLASS OF CERTIFIED SEED? (See Section 83(a) of the Plant Variety Protection Act) <input type="checkbox"/> YES (If "yes", answer items 21 and 22 below) <input checked="" type="checkbox"/> NO (If "no", go to item 23) <input type="checkbox"/> UNDECIDED	
19. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse) a. <input type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety b. <input type="checkbox"/> Exhibit B. Statement of Distinctness c. <input type="checkbox"/> Exhibit C. Objective Description of Variety d. <input type="checkbox"/> Exhibit D. Additional Description of the Variety (Optional) e. <input type="checkbox"/> Exhibit E. Statement of the Basis of the Owner's Ownership f. <input type="checkbox"/> Exhibit F. Declaration Regarding Deposit g. <input type="checkbox"/> Voucher Sample (3,000 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository) h. <input type="checkbox"/> Filing and Examination Fee (\$4,382), made payable to "Treasurer of the United States" (Mail to the Plant Variety Protection Office)		21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES? <input type="checkbox"/> YES <input type="checkbox"/> NO IF YES, WHICH CLASSES? <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED			
23. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. (Please use space indicated on reverse.)		22. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input type="checkbox"/> YES <input type="checkbox"/> NO IF YES, SPECIFY THE NUMBER 1,2,3, etc. FOR EACH CLASS. <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED (If additional explanation is necessary, please use the space indicated on the reverse.)			
24. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT (PLANT BREEDER'S RIGHT OR PATENT)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. (Please use space indicated on reverse.)		25. The owners declare that a viable sample of basic seed of the variety has been furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate. The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act. Owner(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.			
SIGNATURE OF OWNER 		SIGNATURE OF OWNER			
NAME (Please print or type) Robert A. Graybosch		NAME (Please print or type)			
CAPACITY OR TITLE Research Geneticist		DATE 05-10-2008		CAPACITY OR TITLE DATE	

**GENERAL INSTRUCTIONS:** To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be **received** in the PVPO: (1) Completed application form signed by the owner; (2) completed exhibits A, B, C, E, F; (3) for a tuber reproduced variety, verification that a viable (*in the sense that it will reproduce an entire plant*) tissue culture will be deposited and maintained in an approved public repository; and (4) payment by credit card or check drawn on a U.S. bank for \$4,382 (\$518 filing fee and \$3,864 examination fee), payable to "Treasurer of the United States" (See Section 97.6 of the Regulations and Rules of Practice). **NEW:** With the application for a seed reproduced variety **or by direct deposit soon after filing**, the applicant must provide at least 3,000 viable untreated seeds of the variety *per se*, and for a hybrid variety at least 3,000 untreated seeds of each line necessary to **reproduce** the variety. Partial applications will be held in the PVPO for not more than 90 days; then returned to the applicant as un-filed. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 401, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a payment by credit card or check payable to "Treasurer of the United States" in the amount of \$768 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

**NOTES:** It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. The fees for filing a change of address; owner's representative; ownership or assignment; or any modification of owner's name is specified in Section 97.175 of the regulations. (See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of the Regulations and Rules of Practice.)

**Plant Variety Protection Office**

**Telephone:** (301) 504-5518

**FAX:** (301) 504-5291

**General E-mail:** PVPOmail@usda.gov

**Homepage:** <http://www.ams.usda.gov/science/pvpo/PVPindex.htm>

**SPECIFIC INSTRUCTIONS:**

To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority and **provide evidence** that the permanent name of the application variety (even if it is a parental, inbred line) has been cleared by the appropriate recognized authority before the Certificate of Protection is issued. For example, for agricultural and vegetable crops, contact: U.S. Department of Agriculture, Agricultural Marketing Service, Livestock and Seed Programs, **Seed Regulatory and Testing Branch**, 801 Summit Crossing Place, Suite C, Gastonia, North Carolina 28054-2193 Telephone: (704) 810-8870. <http://www.ams.usda.gov/lsg/seed.htm>.

**ITEM**

- 19a. Give: (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method; (2) the details of subsequent stages of selection and multiplication; (3) evidence of uniformity and stability; and (4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified
- 19b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:
- (1) identify these varieties and state all differences objectively;
  - (2) attach replicated statistical data for characters expressed numerically and demonstrate that these are clear differences; and
  - (3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.
- 19c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.
- 19d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, etc.
- 19e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.
20. If "Yes" is specified (*seed of this variety be sold by variety name only, as a class of certified seed*), the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. (See Regulations and Rules of Practice, Section 97.103).
23. See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.
24. See Section 55 of the Act for instructions on claiming the benefit of an earlier filing date.

**22. CONTINUED FROM FRONT** (Please provide a statement as to the limitation and sequence of generations that may be certified.)

**23. CONTINUED FROM FRONT** (Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)

**24. CONTINUED FROM FRONT** (Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 1.4 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

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**Exhibit A - Origin and Breeding History  
'Mace' Hard Red Winter Wheat**

Mace was developed using a modified bulk breeding procedure, followed by re-selection for uniformity of resistance to wheat streak mosaic virus (WSMV). Mace was derived from the cross Yuma//PI 372129/3/CO850034/4/4\*Yuma/5/KS91H184/ArlinS/KS91HW29//NE89526). Yuma (PI 559720) is a hard red winter wheat cultivar released by Colorado State University in 1991. PI 372129 (= T-57) is a Russian wheat aphid [*Diuraphis noxia* (Mordvilko)] resistant landrace from Turkmenistan that carries the Dn4 resistance gene. CO850034 is a breeding line from the Colorado State University breeding program derived from the cross NS14/NS603//'Newton'/3/PB835. KS91H184 is an experimental line from Kansas State University selected from a random mating population involving CI 17884, the source of resistance to WSMV. Arlin S is a sister line of the hard white winter wheat Arlin, developed and released by Kansas State University. KS91HW29 is a hard white winter wheat breeding line developed by Kansas State University, derived from the cross 2157/entry 164 of the 1984 winter/spring wheat observation nursery distributed by Oregon State University. NE89526 is a hard red winter wheat breeding line developed by the University of Nebraska with the pedigree Lancota selection/Siouxland//TX79271.

The F1 generation was harvested from single row plots at Yuma, Arizona, in 1994. Selection was based only on fertility under Arizona growing conditions. The F2 and F3 generations were grown at Lincoln, NE as bulk populations in four-row plots with each row being 2.4 m long with 30 cm between rows. Selection criteria were winter survival, leaf rust resistance, and resistance to Wheat Soilborne Mosaic Virus (SBMV). In 1996, individual spikes were harvested by hand from the F3 bulk population, and used to seed single-plant-progeny-derived F4 head (spike) rows. Head row selections were planted as a single row in a 4-row set that were 0.9 m long with 30 cm between rows. Head row selections were based on rust resistance and winter survival.

In September, 1998, 120 head rows were harvested from the field at Lincoln, NE. These lines, based on pedigrees, had been deemed possible carriers of Wsm-1, a gene conditioning resistance to WSMV. These lines were advanced to an unreplicated F5 observation nursery, and mechanically inoculated with WSMV. In the summer of 1999, ninety-six heads were selected from six of these F5 lines, identified as being possibly heterogeneous for resistance to WSMV. At this point, the line destined to give rise to Mace was found to be segregating for resistance to WSMV. Seed from heads was divided and planted in paired 1 m rows at Lincoln, NE in September 1999. One row of each pair was mechanically inoculated with WSMV. In the spring of 2000, lines were scored as resistant or susceptible based on visual symptoms (yellow-green mottling of leaves and stunting). To verify these phenotypic scores, lines were re-seeded at Hays, KS in the fall of 2001. Lines, along with resistant and susceptible checks, were planted in unreplicated 1 m rows. Plants were infected with naturally occurring WSMV by native wheat curl mites (*Aceria tosichella* Keifer) reared on early-planted wheat. In the spring of 2002, the lines were rated as resistant or susceptible. Resistance in selected lines was re-verified by using a similar approach at Scottsbluff, NE, during the 2004 and 2005 crop years. Mace derived from one of these F5-derived resistant lines. In 2002 and 2003,

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Mace, along with twenty-nine additional WSMV resistant lines of similar origin, were entered in preliminary yield trials at multiple locations in the state of Nebraska. The widely-grown Nebraska cultivars 'Millennium' and 'Wesley' were included as controls. Based on agronomic performance, Mace was advanced for further testing in the USDA-ARS coordinated Northern Regional Performance Nursery, and in the Nebraska State-Wide Small Grains Variety Test.

Seed purification began in 2004. Seed harvested from the advanced yield trials at Lincoln, NE in 2004 was planted in an unreplicated strip plot (80 m<sup>2</sup>) in fall 2004. At harvest maturity, 300 individual spikes were hand-harvested and threshed. In the fall of 2005, the spike selections were used to seed 300 2.5 m unreplicated rows at Yuma, AZ. Visual inspection of the Yuma plantings was used to remove variants (10-15 cm taller in height). In fall 2006, seed harvested from Yuma was planted at Mead, NE in a Breeder Seed increase block (approximately 0.2 ha) and rogued again to remove tall variants. In 2007, a Foundation Seed increase was planted by the Nebraska Foundation Seed Division. Mace has been stable and uniform since 2006. Up to 1% (10:1000) variant plants (10-15 cm taller) may be encountered in subsequent generations. The Nebraska Foundation Seed Division University of Nebraska-Lincoln, Lincoln, NE 68583 will have foundation seed available to qualified certified seed enterprises in 2008.

**Exhibit B - Statement of Distinctness  
'Mace' Hard Red Winter Wheat**

Mace (N02Y5117) is most similar to Wesley, except it carries a 4DL.4AgS wheat-intermediate wheat-grass chromosomal translocation absent in Wesley. In DNA polymerase chain reactions using primers STSJ15L and STSJ15R Mace produces a 420 bp PCR product, indicative of the presence of Wsm-1, conditioning field resistance to WSMV. This PCR product and resistance gene are lacking in Wesley. Finally, Mace carries the high-molecular-weight (HMW) glutenin protein (seed storage proteins) subunits 1, 7+9, and 5+10, encoded by the respective alleles *Glu-A1a*, *Glu-B1c* and *Glu-D1d*. Wesley carries the HMW glutenin subunits 2\*, 7+8, and 5+10, encoded by the respective alleles *Glu-A1b*, *Glu-B1b* and *Glu-D1d*.

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 2.5 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

**U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE  
SCIENCE AND TECHNOLOGY  
PLANT VARIETY PROTECTION OFFICE  
BELTSVILLE, MD 20705**

**Exhibit C**

**OBJECTIVE DESCRIPTION OF VARIETY  
Wheat (*Triticum* spp.)**

NAME OF APPLICANT (S) <b>Robert Graybosch</b>	TEMPORARY OR EXPERIMENTAL DESIGNATION <b>N02Y5117</b>	VARIETY NAME <b>Mace</b>
ADDRESS (Street and No. or RD No., City, State, Zip Code and Country) <b>USDA-ARS, 314 Biochemistry Hall, East Campus University of Nebraska, Lincoln, NE 68583</b>		FOR OFFICIAL USE ONLY <b>PVPO NUMBER #200800300</b>

**PLEASE READ ALL INSTRUCTIONS CAREFULLY:**

Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g.,    or   ) when number is either 99 or less or 9 or less respectively. Data for quantitative plant characters should be based on a minimum of 100 plants. Comparative data should be determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used: \_\_\_\_\_ Please answer all questions for your variety; lack of response may delay progress of your application.

**1. KIND:**

- 1 = Common  
2 = Durum  
3 = Club  
4 = Other (Specify) \_\_\_\_\_

**2. VERNALIZATION:**

- 1 = Spring  
2 = Winter  
3 = Other (Specify) \_\_\_\_\_

**3. COLEOPTILE ANTHOCYANIN:**

- 1 = Absent                      2 = Present

**4. JUVENILE PLANT GROWTH:**

- 1 = Prostrate              2 = Semi-Erect              3 = Erect

**5. PLANT COLOR: (boot stage)**

- 1 = Yellow-Green  
2 = Green  
3 = Blue-Green

**6. FLAG LEAF: (boot stage)**

- 1 = Erect                      2 = Recurved  
1 = Not Twisted              2 = Twisted  
1 = Wax Absent              2 = Wax Present

**7. EAR EMERGENCE:**

Number of Days (Average) *(after 11/)*

Number of Days Earlier Than \* *Antelope*

Same As \*

Number of Days Later Than \* *Wesley*

\*Relative to a PVPO-Approved Commercial Variety Grown in the Same Trial

**8. ANTHR COLOR:**

- 1 = Yellow              2 = Purple

6

## 9. PLANT HEIGHT: (from soil to top of head, excluding awns)

cm (Average)

cm Taller Than

Wesley

\*

Same As

\*

cm Shorter Than

\*

## 10. STEM:

## A. ANTHOCYANIN

1 = Absent 2 = Present

## B. WAXY BLOOM

1 = Absent 2 = Present

## C. HAIRINESS (last internode of rachis)

1 = Absent 2 = Present

## D. INTERNODE

1 = Hollow

2 = Semi-Solid

3 = Solid

Number of Nodes

## E. PEDUNCLE

1 = Erect

2 = Recurved

3 = Semi-Erect

cm Length

## F. AURICLE

Anthocyanin:

1 = Absent

2 = Present

Hair:

1 = Absent

2 = Present

## 11. HEAD: (At Maturity)

## A. DENSITY

1 = Lax

2 = Middense (Laxidense)

3 = Dense

## B. SHAPE

1 = Tapering

2 = Strap

3 = Clavate

4 = Other (Specify) \_\_\_\_\_

## C. CURVATURE

1 = Erect

2 = Inclined

3 = Recurved

## D. AWNEDNESS

1 = Awnless

2 = Apically Awnletted

3 = Awnletted

4 = Awned

## 12. GLUMES: (At Maturity)

## A. COLOR

1 = White

2 = Tan

3 = Other (Specify) \_\_\_\_\_

## B. SHOULDER

1 = Wanting

2 = Oblique

3 = Rounded

4 = Square

5 = Elevated

6 = Apiculate

7 = Other (Specify) \_\_\_\_\_

## C. SHOULDER WIDTH

1 = Narrow

2 = Medium

3 = Wide

## D. BEAK

1 = Obtuse

2 = Acute

3 = Acuminate

## E. BEAK WIDTH

1 = Narrow

2 = Medium

3 = Wide

## F. GLUME LENGTH

1 = Short (ca. 7 mm)

2 = Medium (ca. 8 mm)

3 = Long (ca. 9 mm)

## G. WIDTH

1 = Narrow (ca. 3 mm)

2 = Medium (ca. 3.5 mm)

3 = Wide (ca. 4 mm)

## H. PUBESCENCE

1 = Not Present

2 = Present



## 13. SEED:

## A. SHAPE

- ☒ 1 = Ovate  
☐ 2 = Oval  
☐ 3 = Elliptical

## B. CHEEK

- ☒ 1 = Rounded  
☐ 2 = Angular

## C. BRUSH

- ☒ 1 = Short  
☐ 2 = Medium  
☐ 3 = Long
- ☒ 1 = Not Collared  
☐ 2 = Collared

## D. CREASE

- ☒ 1 = Width 60% or less of Kernel  
☐ 2 = Width 80% or less of Kernel  
☐ 3 = Width Nearly as Wide as Kernel

- ☒ 1 = Depth 20% or less of Kernel  
☐ 2 = Depth 35% or less of Kernel  
☐ 3 = Depth 50% or less of Kernel

## E. COLOR

- ☒ 1 = White  
☐ 2 = Amber  
☐ 3 = Red  
☐ 4 = Other (Specify) \_\_\_\_\_

## F. TEXTURE

- ☒ 1 = Hard  
☐ 2 = Soft  
☐ 3 = Other (Specify) \_\_\_\_\_

## G. PHENOL REACTION (See Instructions)

- ☒ 1 = Ivory  
☐ 2 = Fawn  
☐ 3 = Light Brown  
☐ 4 = Dark Brown  
☐ 5 = Black

## H. SEED WEIGHT

- ☒ 27 g/1000 Seed (whole number only)

## I. GERM SIZE

- ☒ 1 = Small  
☐ 2 = Midsize  
☐ 3 = Large

## 14. DISEASE: PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

(0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)

- |  |   |
|--|---|
| <input checked="" type="checkbox"/> 2 Stem Rust ( <i>Puccinia graminis</i> f. sp. <i>tritici</i> ) | <input checked="" type="checkbox"/> 3 Leaf Rust ( <i>Puccinia recondita</i> f. sp. <i>tritici</i> )           |
| <input checked="" type="checkbox"/> 3 Stripe Rust ( <i>Puccinia striiformis</i> )                  | <input type="checkbox"/> 0 Loose Smut ( <i>Ustilago tritici</i> )   |
| <input type="checkbox"/> 0 Tan Spot ( <i>Pyrenophora tritici-repentis</i> )                        | <input type="checkbox"/> 0 Flag Smut ( <i>Urocystis agropyri</i> )  |
| <input type="checkbox"/> 0 Halo Spot ( <i>Selenophoma donacis</i> )                                | <input type="checkbox"/> 0 Common Bunt ( <i>Tilletia tritici</i> or <i>T. laevis</i> )                        |
| <input type="checkbox"/> 0 <i>Septoria nodorum</i> (Glume Blotch)                                  | <input type="checkbox"/> 0 Dwarf Bunt ( <i>Tilletia controversa</i> )   |
| <input type="checkbox"/> 0 <i>Septoria avenae</i> (Speckled Leaf Disease)                          | <input type="checkbox"/> 0 Karnal Bunt ( <i>Tilletia indica</i> )   |
| <input type="checkbox"/> 0 <i>Septoria tritici</i> (Speckled Leaf Blotch)                          | <input type="checkbox"/> 0 Powdery Mildew ( <i>Erysiphe graminis</i> f. sp. <i>tritici</i> )                  |
| <input type="checkbox"/> 1 Scab ( <i>Fusarium</i> spp.)  | <input type="checkbox"/> 0 "Snow Molds"   |
| <input type="checkbox"/> 0 "Black Point" (Kernel Smudge)   | <input type="checkbox"/> 0 Common Root Rot ( <i>Fusarium</i> , <i>Cochliobolus</i> and <i>Bipolaris</i> spp.) |
| <input type="checkbox"/> 1 Barley Yellow Dwarf Virus (BYDV)  | <input type="checkbox"/> 0 Rhizoctonia Root Rot ( <i>Rhizoctonia solani</i> )                                 |
| <input type="checkbox"/> 1 Soilborne Mosaic Virus (SBMV)   | <input type="checkbox"/> 0 Black Chaff ( <i>Xanthomonas campestris</i> pv. <i>translucens</i> )               |
| <input checked="" type="checkbox"/> 0 Wheat Yellow (Spindle Streak) Mosaic Virus                   | <input type="checkbox"/> 0 Bacterial Leaf Blight ( <i>Pseudomonas syringae</i> pv. <i>syringae</i> )          |
| <input checked="" type="checkbox"/> 2 Wheat Streak Mosaic Virus (WSMV)                             | <input type="checkbox"/> Other (Specify) _____  |
| <input type="checkbox"/> Other (Specify) _____   | <input type="checkbox"/> Other (Specify) _____  |
| <input type="checkbox"/> Other (Specify) _____   | <input type="checkbox"/> Other (Specify) _____  |
| <input type="checkbox"/> Other (Specify) _____   | <input type="checkbox"/> Other (Specify) _____  |

## 15. INSECT: (0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)

PLEASE SPECIFY BIOTYPE (where needed)

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> 1 Hessian Fly ( <i>Mayetiola destructor</i> ) | <input checked="" type="checkbox"/> 1 Other (Specify) <u>greenbug</u> |
| <input type="checkbox"/> 0 Stem Sawfly ( <i>Cephus</i> spp.)                      | <input type="checkbox"/> 1 Other (Specify) <u>RWA</u>                 |
| <input type="checkbox"/> 0 Cereal Leaf Beetle ( <i>Oulema melanopa</i> )          | <input type="checkbox"/> Other (Specify) _____                        |

#200800300

Exhibit C (Wheat)

15. INSECT: (continued) (0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)

PLEASE SPECIFY BIOTYPE (Where Needed)

☒

Russian Aphid (*Diuraphis noxia*)

☐

Other (Specify) \_\_\_\_\_

☒

Greenbug (*Schizaphis graminum*)

☐

Other (Specify) \_\_\_\_\_

☐

Aphids

☐



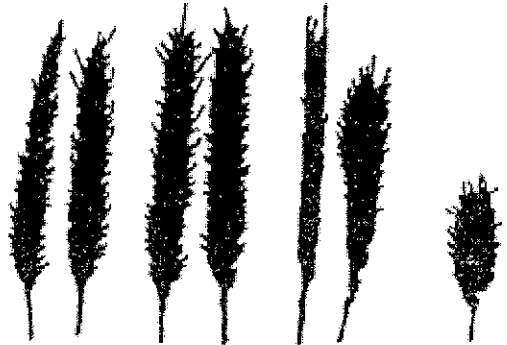


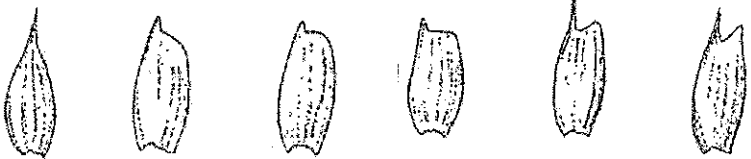


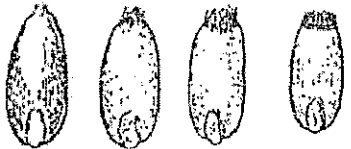
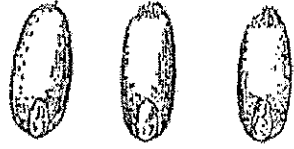



Other (Specify) \_\_\_\_\_

16. ADDITIONAL INFORMATION ON ANY ITEM ABOVE, OR GENERAL COMMENTS:

9

## WHEAT DESCRIPTOR ILLUSTRATIONS

Section Numbers Correspond to the Numbers of the Sections on the Form

<p>4. EARLY PLANT GROWTH HABIT:</p>  <p>1 Prostrate      2 Intermediate      3 Erect</p>	<p>10. (D.) STEM INTERNODE X-SECTION:</p>  <p>1 Hollow      2 Semi-solid      3 Solid</p>	<p>11. (B.) SPIKE SHAPE:</p>  <p>1 Tapering      2 Oblong      3 Clavate      4 Elliptical</p>	
<p>11. (D.) AWNEDNESS:</p>  <p>1 Awnless      2 Apically Awnleted      3 Awnleted      4 Awned</p>	<p>12. (D.) BEAK SHAPE:</p>  <p>1 Obtuse      2 Acute      3 Acuminate</p>		
<p>12. (C.) SHOULDER SHAPE:</p>  <p>1 Wanting      2 Oblique      3 Rounded      4 Square      5 Elevated      6 Apiculate</p>			
<p>13. (A.) SEED SHAPE:</p>  <p>1 Ovate      2 Oval      3 Elliptical</p>	<p>13. (B.) CHEEK SHAPE:</p>  <p>1 Rounded      2 Angular</p>	<p>13. (C.) BRUSH SIZE</p>  <p>1 Small      2 Midsized      3 Large      4 Collared</p>	<p>13. (C.) BRUSH HAIR LENGTH:</p>  <p>1 Short      2 Medium      3 Long</p>
<p>13. (I.) GERM (EMBRYO) SIZE:</p>  <p>1 Small      2 Midsized      3 Large</p>	<p>13. (D.) SEED CREASE WIDTH:</p>  <p>1 Narrow      2 Mid-wide      3 Wide</p>	<p>13. (D.) SEED CREASE DEPTH:</p>  <p>1 Shallow      2 Mid-Deep      3 Deep</p>	

**Exhibit D - Additional Description of the Variety:**

200800300

End-use quality evaluations of Mace (Table 1) were conducted by the USDA-ARS Hard Winter Wheat Quality Laboratory, Manhattan, KS on samples obtained from the 2004 and 2005 NRPN, composited by agro-ecological production zone. Six samples were evaluated from this two year period. Mace displayed significantly lower flour ash contents, and significantly longer Mixograph and bake mix times, than the three check cultivars. Mean Mixograph tolerance score of Mace was significantly higher than those of Nuplains and Nekota, and equal to that of Harding. Few other differences (Table 1) were noted. Mace carries the high-molecular-weight glutenin subunits 1, 7+9, and 5+10, encoded by the respective alleles Glu-A1a, Glu-B1c and Glu-D1d.

Table1. End-use quality attributes of Mace compared to check cultivars from the 2004 and 2005 Northern Regional Performance Nursery.

Cultivar	Kernel weight (mg)	Grain hardness score	Grain protein concentration (g/kg)	Flour milling yield (g/kg)	Flour ash content (g/kg)	Flour protein concentration (g/kg)
Harding	28.4	62.4	145	616	4.27	123
Nuplains	27.7	70.0	139	660	4.07	120
Nekota	31.5	61.7	135	652	3.75	116
Mace	26.5	61.5	132	631	3.50	115
l.s.d. (0.05)						
	3.0	ns	ns	20	0.50	ns

Cultivar	Mixograph water absorption (g/kg)	Mixograph time (min)	Mixograph tolerance (0-6)	Bake water absorption (g/kg)	Bake mix time (min)	Crumb score (0-5)	Loaf volume (ml)
Harding	637	3.7	4	632	4.6	3	905
Nuplains	631	2.7	3	615	3.8	4	916
Nekota	626	3.2	3	626	4.2	3	884
Mace	625	4.6	5	635	6.2	3	844
l.s.d. (0.05)							
	ns	0.5	1.0	ns	1.0	ns	ns

U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). The information is held confidential until the certificate is issued (7 U.S.C. 2426).

EXHIBIT E  
STATEMENT OF THE BASIS OF OWNERSHIP

1. NAME OF APPLICANT(S) The United States Government, as represented by the Secretary of Agriculture.	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER N02Y5117	3. VARIETY NAME Mace
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP, and Country)  USDA-ARS 314 Biochemistry Hall, East Campus, UNL, Lincoln, NE 68583	5. TELEPHONE (Include area code) 402-472-1563	6. FAX (Include area code) 402-472-4020
7. PVPO NUMBER 200800300		

8. Does the applicant own all rights to the variety? Mark an "X" in the appropriate block. If no, please explain. ☒ YES ☐ NO

9. Is the applicant (individual or company) a U.S. national or a U.S. based company? If no, give name of country. ☐ YES ☐ NO  
U.S. Government Agency

10. Is the applicant the original owner? ☒ YES ☐ NO If no, please answer one of the following:

a. If the original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. National(s)?

☐ YES ☐ NO If no, give name of country

b. If the original rights to variety were owned by a company(ies), is (are) the original owner(s) a U.S. based company?

☐ YES ☐ NO If no, give name of country

11. Additional explanation on ownership (Trace ownership from original breeder to current owner. Use the reverse for extra space if needed):

## PLEASE NOTE:

Plant variety protection can only be afforded to the owners (not licensees) who meet the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 0.1 hour per response, including the time for reviewing the instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotope, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 5 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

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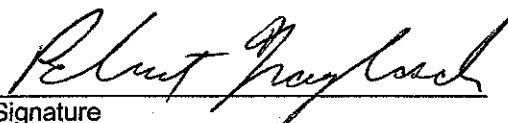
**U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE  
SCIENCE AND TECHNOLOGY  
PLANT VARIETY PROTECTION OFFICE  
BELTSVILLE, MD 20705**

**EXHIBIT F  
DECLARATION REGARDING DEPOSIT**

<b>NAME OF OWNER (S)</b>  The Government of the United States, as represented by the Secretary of Agriculture.	<b>ADDRESS (Street and No. or RD No., City, State, and Zip Code and Country)</b> 314 Biochem Hall, East Campus University of Nebraska Lincoln, NE 68583	<b>TEMPORARY OR EXPERIMENTAL DESIGNATION</b> N02Y5117
<b>NAME OF OWNER REPRESENTATIVE (S)</b>  Robert Graybosch	<b>ADDRESS (Street and No. or RD No., City, State, and Zip Code and Country)</b>  same as above	<b>VARIETY NAME</b> Mace  <b>FOR OFFICIAL USE ONLY</b>  <b>PVPO NUMBER</b> 200800300

I do hereby declare that during the life of the certificate a viable sample of propagating material of the subject variety will be deposited, and replenished as needed periodically, in a public repository in the United States in accordance with the regulations established by the Plant Variety Protection Office.

Mace has been deposited in the USDA-ARS National Small Grains Collection, Aberdeen, Idaho, and is housed as PI 651043.

  
 Signature

8/15/08  
 Date